Modern ICT Based Teaching and Learning Support Systems and Solutions in Higher Education Practice

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Abstract

In Hungarian and international practice, many attempts and sets of example can be found as a direct or indirect use of the latest ICT (Information and Communication Technologies) in the teaching-learning process. With the support of Web 2.0 and e-learning 2.0 new education informatics methods have been published, often reshaping significantly the learning environment with new media instruments (Forgó, 2011). This way we shall get all the way to digital pedagogy 2.0 and its latest developments. The Web 3.0 as a line of continuation goes rather beyond the scope of existing technologies, and in addition to previous services promotes intelligent orientation in large data sets, reveals primacy of distributed mobile technologies and connectivity options as well as provides a among the first a space for new technologies such as artificial intelligence. The education system is trying to follow the new environment, the new roles, the digital generation's attitude, and the challenges of constant changes, as indicated by several international and Hungarian community forums. (For example Forum of Innovative Teachers). However, due to the development of multi-dimensional background variables adequate education / learning methodology recipes solutions are not available just yet. The research is looking for questions arising from this situation, searching for learning ways and habits of the digital generation as well as for the latest tools of digital communication and in order to achieve a more efficient outcome, it seeks methodological and technological support on base of higher education.

Keywords

Information and Communications Technology. Electronic and mobile learning environment. Micro content. Digital communications. 3D. Social networks.

INTRODUCTION

The main feature of the information society is that the information has become a primary value. Because of economic globalization and corporate governance crisis the main engine of information society is computer technology and the rapid development of telecommunications, its most important stages are the spread of personal computers and the emergence of broadband networks, its symbolic technological innovations are the Internet and mobile phones. As the result of this rapid development no area of life can avoid the application of information technology. It also involves important social changes: the rate of employment in the information sector thrives dramatically, telework and life-

ISBN: 978-80-7478-497-2

long learning becomes possible and necessary the same time. As a result, the development of digital literacy and the dissemination of information infrastructure may appear as primary strategic objective. The same time, living in the information society, people may face many previously unknown problems such as unlimited quantity, but various quality of available information in need of proper assessment, filtering and processing or the protection of privacy over control of economic or political powers(Ollé; Papp; Lévai; Tóth-Mózer; Virányi, 2013). This effects the environment of the society. The nature of work is changing, the changes are related to the individual learning processes, attitudes, developed learning habits, or the altered teacher and student roles (Szűts, 2013).

We often refer to our accelerated world and we face the an information overflow while equipped with gadgets. As in other spheres of life, of course, education does not remain the same in the ICT-based world. In the Internet era, electronic learning environments, that is all functions-organizing learning content management interfaces related to learning are more and more being built into the formal education system is (Benedek, 2013).

A good example is the Moodle (Modular Object-Oriented Dynamic Learning Environment) system used and Budapest University of Technology. The system is used by millions worldwide and in addition it is rapidly being deployed into public education. In the meaning of pedagogical tasks and principles a less mature, but in the practice already adopted at ELTE (Eötvös Lóránd University) is a virtual learning environment where users of a virtual campus learn real content, while the students can participate in a virtual classroom from their homes as well.

According to today's research surveys, the Y-and Z-digital generation members who at present and near future form group of students prefer more informal forms of learning which are not closely related to the educational institutions.

"Similar to Moodle systems such as the Iliad or the OLAT (Online Learning and Training), it is traceable, who logged in, and what amount of time spent on the surface, and what activity did he show in the system. But this is still a too bound framework for most young people" (Molnár, 2012). On similar principle as Moodle works the EDX, a system born as collaboration of Harvard and MIT (Massachusetts Institute of Technology), or OpenLearn created at one of the distance learning the citadel, the Open University. The three websites have in common that only one registration is required to access quality content, where in addition to the name and e-mail address no other information is required about us.

TYPICAL HUNGARIAN AND INTERNATIONAL ICT PRACTICES

The most up to date national and international ICT solutions shows the following trends regarding teaching and learning.

- As a result of interpenetration, network access is not available for almost everybody. We may say the digital gap has ceased to exist, in international comparison in particular.
- The majority of new developments strongly relies on this extended access such as web 2.0 services.

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- The focus of progressive ICT development and use is shifting towards mobile tools.
- Integrated, complex ICT tools and systems are becoming organic parts of everyday life and learning at an increasing pace.
- Regarding ICT generations, the perfection of existing generations is the prevailing trend instead of introducing new generation inventions.
- In today's world of technological enhancements and supported systems the developments are increasingly pointing towards the free, open, and integrated systems.
- Regarding web 2.0 contents, portal management is increasingly less dependent on software engineering skills. Instead, the more simple and user friendly CMSs (Content Management System) are becoming increasingly popular. LMS (Learning Management System) is a software package to implement and support teaching and learning programmes and courses, facilitate the uniform management of courses and participants (students) and to support the entire teaching process (Kommers, 2010).
- LCMSs also support the development of curricula and e-learning based, interactive multimedia courses.
- Besides the the man-machine relation the importance of machine-to-machine interaction increases in learning forms.
- CMS is the abbreviation of Content Management System. It was developed at the same as PHP and it is based on the application of PHP and SQL engines. As its use is quite simple, users not possessing technical qualifications or programming knowledge are also able to apply it to edit websites or electronic publications and publish online. These frameworks may be customized, modified, extended and structured online in use (Paulsen, 2002).

In Hungary, the most widely used CMS systems are Drupal – http://drupal.hu, Joomla – http://joomla.org.hu, Moodle – http://moodle.org, Wordpress – http://word-press.hu and Olat – www.olat.org. They may be divided into classes according to the following criteria:

- open source or proprietary software
- programming language (php/.NET asp)
- simple or modular framework system with or without functional plugins
- According to EU practice, the following protocols and framework systems have been introduced and applied in relation to the web 2.0 model (see Fig. 1.) As shown by the figure, content management systems are supported by a specific content development tool (CCT – Content Creator Toolkit). In addition to learning management systems, another one specifically supporting students is also included (SMS – Student Management System). Administrative and statistical tasks are managed by a separate financial and accounting system (AS – Accounting System) (Klimes; Balogh, 2010).

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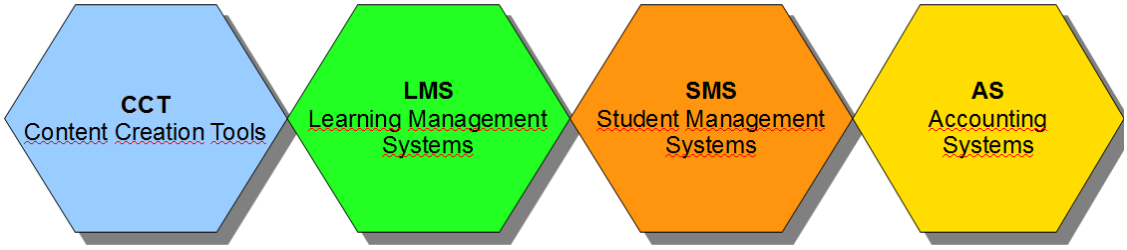

Fig. 1: Web 2.0 systems in the EU, source: own edited photo

- An increasing number of network based ICT solutions are used in education with special regard to learning environments and social or collaborative engines (like ELGG, the open source social networking engine).

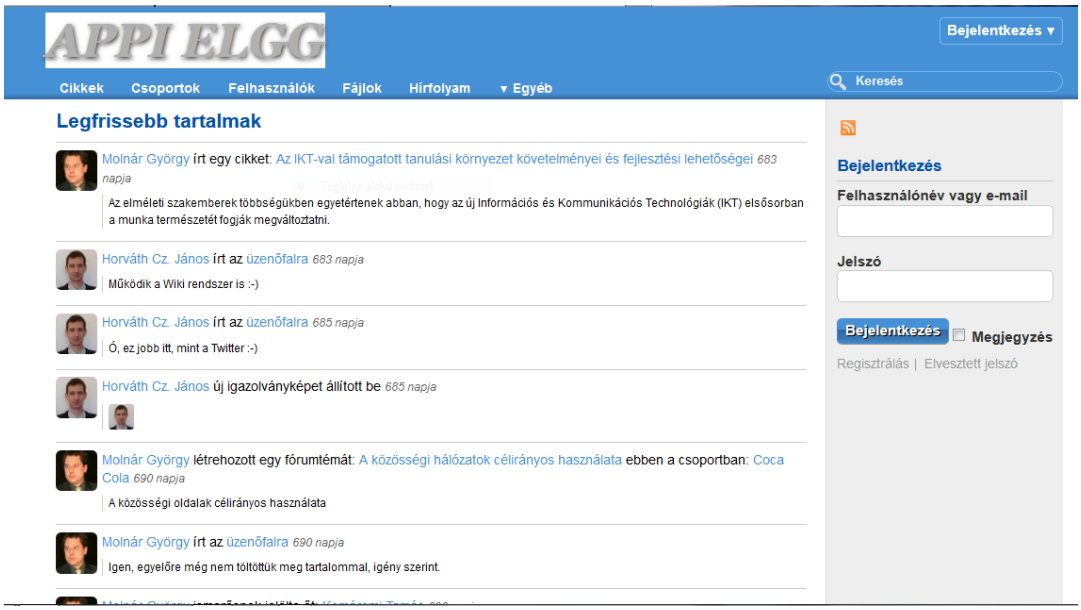

Fig. 2: The social portal of APPI ELGG, source: own photo

- In addition to real, traditional educational environments, virtual classrooms and learning environments promoting atypical learning forms also play an increasingly important role at micro and mezzo levels. Such a system for example is Second Life where we can learn via our avatars or Ning, where a virtual classroom is accessible by means of an online platform (Castells, 2005).
- Information, which represents the foundation of knowledge based society is available in such a sophisticated form and represents such a load for society that justify the increasing importance of visual representation forms (Infographics) in understanding and processing large volumes of information (Molnár, 2012).

From the web 2.0 applications available worldwide, the number of first generation ones (web 1.0 applications) is decreasing as opposed to web 2.0 portals with significant growth trends. These latter ones also facilitate interactivity in addition to editing contents. The general features of web 1.0 tools are listed below.

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- Content provider services: textual, visual (photos, graphics, figures) audio and video contents
- Contents published on data storage devices (CD supplements, USB drives, DVDs)
- Internet (web) based contents: hyperlinks, HTML 4.0, HTML5.0 on static websites

General features of web 2.0 tools:

- Web 2.0 is an IT medium where users organize and manage contents together
- The owner of the portal only provides the IT framework without restricting contents
- Organized bottom up (from users towards groups like blog communities, forums)
- Service oriented, characterized by service development
- Relativistic management of personal data; data security problems are typical where the personal, social and business data of users may be acquired by third parties (Buda, 2010).

The next section lists those of the 100 most popular web 2.0 applications that are currently in use and essential for independent learning (Forgó, 2011).

- Twitter (microblog tool)
- YouTube (video share)
- Google Documents (administrative teamwork tool)
- Delicious (social bookmarking site)
- SlideShare (presentation storage)
- Skype (instant messaging / VoIP)
- Google Reader (RSS / feed reader)
- WordPress (blog tool)
- Facebook (social network)
- Moodle (LMS system)
- Prezi (presentation software)
- Google (search tool)

In addition to web 2.0 portals, web 3.0 applications should also be mentioned here. This is not a new feature at all, even though we have not even been fully familiarized ourselves with all the web 2.0 functions. The web 3.0 generation means contents, commerce, community and context are all personalized and combined with vertical search. The simplified formula for web 3.0 is Web 3.0 = (4C + P + VS) (http://longhand.hu/web2/web-30.php).

EMPIRICAL ASSESSMENT RESEARCH OF ICT ATTITUDE AND DIGITAL COMPETENCES

Characteristics of the study and the circumstances

The survey took place between 2013. September 10 and 25 with the involvement of individual units within the BKV (Budapest Transport Company) and MÁV (Hungarian State

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Railways). The study questionnaire was made with the Google form designer and form sheet. The introductory survey questions were supposed to explore the sociological characteristics of individual respondents, they enquired about equipment requirements, use of knowledge, and assessed the capability of the application of the modern distance education methods. 73 people attended the anonymous data reporting. Of these, 64 worked at BKV and 9 were employees of the MÁV. Target segment of the study included all selected, as employees engaged in intellectual work or work in lower and middle management at their workplace.

The assessment was made with the respondents involved. Accordingly, the results revealed can only be locally representative. Representativeness in a general sense, cannot be applied nationally to the identified characteristics in other companies, or only with significant restrictions to the interpreted data. Isomorphic representativeness therefore replaced with the homomorphic approach. In order for the results to be interpreted in other areas in connection with other companies, in the following we intend to establish characteristic of the sample rate of 95 % confidence intervals. In case of companies with these characteristics which fall within the confidence intervals, the results can be accepted without reservation (the survey is representative). The greater differences can be observed for a particular company, the more necessary is for the results to be taken as approximates.

The main objective of the survey was to explore defined parameters for the two fundamental elements. In this context, therefore, among the target population we studied the knowledge potential of digital learning tools, services and knowledge management levels, personal learning characteristics and habits, as well as the respondent's attitude during the learning course. Our processing method in addition to simple descriptive statistical methods included also multivariate analytical methods (cluster, factor analysis, multidimensional scaling) procedures as well. Due to space limitations of the article we didn’t present full analysis but used graphs and dendograms and summarized the results in the text.

For example, and for the sake of argumentation of analysis carried out we reported the results using a dendrogram, where one can see the distinctive curl clusters. Based on the data conversation, phone calls and e-mail separate from the other communication method. According to this interpretation this attitude is linked to frequency and preference. On this basis, we can state that on this level the through the framework type of communication seems to be spreading.

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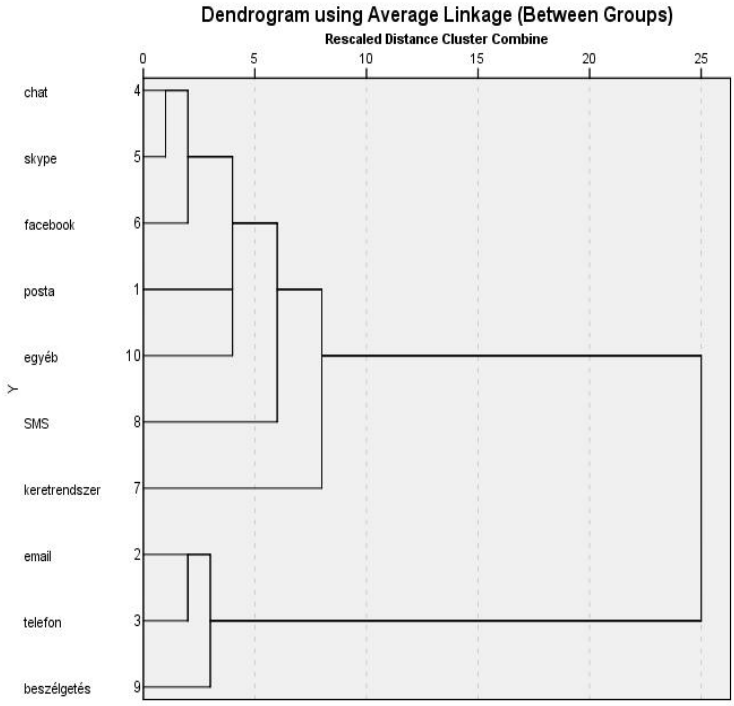

Fig. 3: Dendogram, source: own photo

The results of the survey is used in the context

In respect of communications modes used the 3 spaces of communication do not differ. Both in business, workplace and private communication of e-mail, telephone calls and personal conversation (negotiation) is dominant. Also, all three spaces are limited area of SMS expression. The traditional mailing, chatting, Skype and Facebook use and communication using framework is negligible.

In terms of means of communication the 3 spaces are very similar to one another, smaller (but significant) differences may discovered between them. All of them feature primary orality (exclusive of any devices), desktop computer (with the exception of private communications, where laptop and smartphone are increasingly taking over the role). The use of the traditional postal services are increasingly pushed to the background, the IP phone, video phone, tablet, notebook and netbook is not widespread.

In corporate training based on e-learning 86% of employees would participate, 44% of them study with desktop (not mobile) computer. The majority (82%) would use their own devices, but there is a significant proportion of those (22%) who would learn with tablet provided by their company. The further training could take 2 hours a week for an average respondent, but every 9th respondent would learn 5 hours a week, one in six would dedicate less than an hour a week.

In respondent segments the most noticeable difference is between the sexes. Women use more varied forms and tools of communication, but in case of some higher priced means generally men are early adopters. In terms of education there were significantly less differences, but it can be said that the more educated use a wider spectrum of modes and instruments. Analysis from the position taken in company show that only a few differences can be seen. Generally speaking, the lower-level level employees use bigger

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variety of tools to communicate. The rest of the analysis did not show significant differences.

Among the respondents the awareness of the teachers' group in forms and means of communication is significantly higher than among the others. The use these means in different spaces (work, private, etc) is both higher than the use of others, and the spectrum is wider too.

Testing latent variables clarify that with minor differences in both test target groups (private sector, public education) in all communications arena personal conversations, e-mailing and phone calls are the crucial method, while the primary orality, a desktop computer and phone (mostly traditional version) are the tools most often used. Between the two spheres there are a number of minor differences that can be revealed, but in whole they do not affect the high degree of similarity.

NEW POSSIBILITIES IN THE ICT ENVIRONMENT OF THE FUTURE

Further options for innovation are represented by current and future applications such as Second Life, 3D Desktop, integrating Leonar3Do measuring practicals into the Classroom Response System, incorporating videos and educational videos into the educational process and Kinect-based sensory solutions.

The development illustrated by the picture below solves the problem represented by the lack of space in 2D displays for the numerous modern applications. In the near future, 3D operating systems may be introduced via the 3D desktop system.

Fig. 4: 3D Desktop, source: own photo

An obvious development direction for all the solutions discussed in the previous sections regardless of their contents is creating and using 3D presentations in education, relying on prezi.com (see Fig. 23). The 3D texture is prepared by the editor of a 3D software (e.g. Blender) and the content rendered from the 3D frames are composed into a video based flash format. The output is the presentation that may be presented by means of a media player at lectures (e.g. Windows Media Player Classic). The presentation may also be projected frame by frame where the routes between individual 3D elements can

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be visualized or selected frames may be projected without showing the ones between (Molnár, 2011).

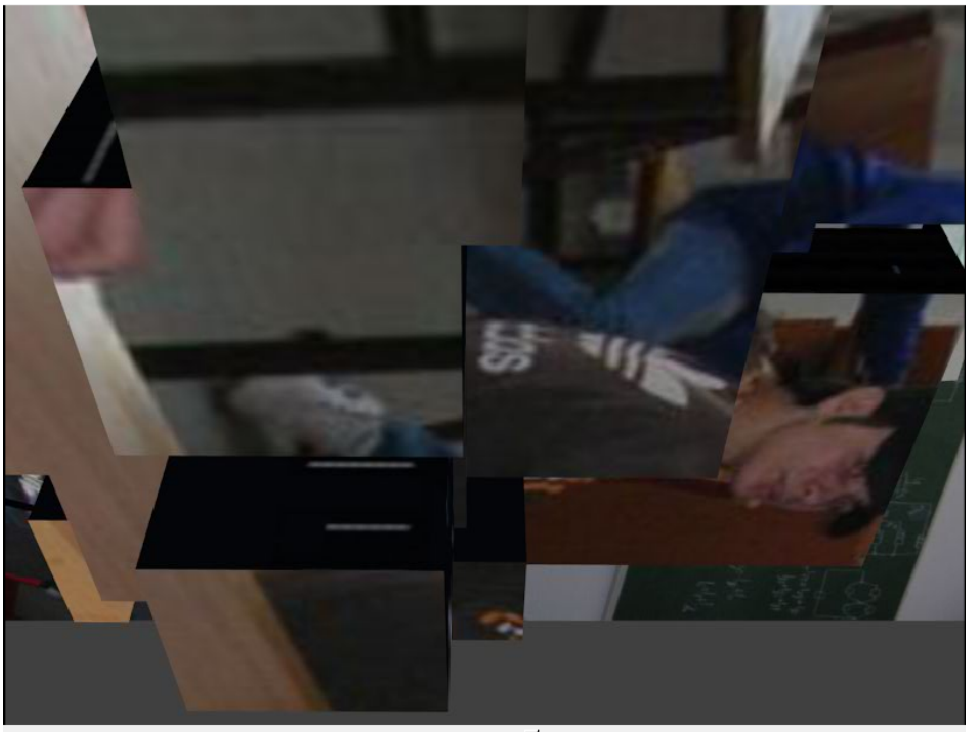

Fig. 5: 3D presentation, source: own photo

CONCLUSION

Based on past experience in higher education and empirical studies conducted it is confirmed that it is not only a particular application or program, but also function is an essential element in new ICT supported electronic world. These are often characterized as incomplete instrumental systems, with basic functions only to support mostly digital immigrants'/natives' toolkits.

The main feature of these areas is that there are no established pragmatic regulatory systems (Facebook, SlideShare, Pinterest). The results of the research showed a number of innovative good practices. These all take into account adaptation to students' learning habits involved in higher education, they attitudes toward new student role, and last but not least, adapt to the expectations that are incorporated into the next teaching, culture methodologies. On the basis of the survey carried out, the result show the most preferred learning methods, forms, learning time spent, their through-the-day distribution, as well as the parameters of the ICD based communication tools. Due to the results we can predict behavioral culture of the target group.

As a continuation of the research it would be useful to differentiate and analyse the specific clusters and factors.

This paper essentially discusses the various dimensions of the new ICT environment from both theoretical and practical aspects. By introducing the reader with the ideas of previous articles including novelties and their practical relevance, the author hopes to

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have contributed to a change of attitude in these fields. In addition to the national and international trends in teaching and learning presented here, technical and methodological specifications, case studies and actual examples are also offered to the reader, providing added value to educational science and shifting the focus within it to the interdisciplinary approach and the development directions defined by it, always considering education techniques and methodology. Adapting the micro and meso methods described in the educational process may serve as a starting point for marking out the track for future educational development in addition to supporting innovation.

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ISBN: 978-80-7478-497-2